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10/722,048	11/25/2003	Mark Andrew Whittaker Stewart	IS01456MCG	8342

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EXAMINER	
LOO, JUVENA W	

ART UNIT	PAPER NUMBER
2609	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/722,048	STEWART, MARK ANDREW WHITTAKER	
	Examiner	Art Unit	
	Juvena W. Loo	2609	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 November 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *25 November 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

This is in response to application filed on November 25, 2003 in which claims 1 to 20 are presented for examination.

Status of Claims

Claims 1-20 are pending, of which claims 1, 10, and 17 are in independent form.

Specification

1. The specification is objected to because the application numbers for the related cases are not listed.

Claim Objections

2. Claims 1, 5, 7, 9, 10, 17, 19, and 20 are objected to because of the following informalities:

In particular, claims 1, 5, 7, 9, 10, 17, 19, and 20 are objected to because they include reference characters, DLID, which are not enclosed within parentheses. Appropriate correction is required.

3. Claim 16 is objected to because of the following informalities:

In particular, claim 16 is objected to because it is not clear. It is dependent on claim 10. However, it also makes a reference to claim 11. Appropriate correction is required.

Claim Rejections - 35 USC § 112

4. Claims 1, 4, 5, 7, 9, 10, 14, 17, 19, and 20 contain the trademark/trade name InfiniBand. Where a trademark or trade name is used in a claim as a limitation to identify or describe a particular material or product, the claim does not comply with the requirements of 35 U.S.C. 112, second paragraph. See *Ex parte Simpson*, 218 USPQ 1020 (Bd. App. 1982). The claim scope is uncertain since the trademark or trade name cannot be used properly to identify any particular material or product. A trademark or trade name is used to identify a source of goods, and not the goods themselves. Thus, a trademark or trade name does not identify or describe the goods associated with the trademark or trade name. In the present case, the trademark/trade name is used to identify/describe InfiniBand switch and, accordingly, the identification/description is indefinite.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

6. Claims 10 and 12-15 are rejected under 35 U.S.C. 102(a) as being anticipated by Brahmaroutu (US 2003/0033427 A1).

Regarding claim 10, Brahmaroutu discloses a method comprises providing a plurality of InfiniBand switches (Figure 1: an InfiniBand switch fabric) coupling a plurality end nodes to form a network (Figure 2; Page 2, Section 22: a data network with an InfiniBand switch fabric for allowing a host system to communicate to other systems); calculating a plurality of routing trees for the InfiniBand switch (Pages 5-6, Sections 46-54: the shortest paths from each switch to every other switch in the network are computed); calculating a plurality of DLIDs and a set of forwarding instructions (Page 7, Section 60: a destination local identifier is assigned to a switch port (destination port). The multi-path assignment algorithm first determines the destination switch that the destination port is directly connected to, then it identifies all the links that exist between the destination switch and other switches in the network), each of the plurality of DLIDs corresponds to one of a plurality of routing trees and one of a plurality of end nodes in the network (Page 7, Sections 61-63: once all paths are identified, the multi-path algorithm assigns a combination label to a specific path. All direct links that connect the destination switch to other switches are first sorted and then the multi-path algorithm looks up the best route between the switch identified and the switch from the all-switch shortest paths table); populating a forwarding table of InfiniBand switch with the plurality of DLIDs and the set of forwarding instructions (Page 7, Section 66: once the forwarding

tables are built for all switches, the forwarding tables will be downloaded into respective switches in the network).

Regarding claim 12, Brahmaroutu discloses all the limitations of claim 10. Additionally, Brahmaroutu discloses each of the plurality of end nodes comprises a destination, and the destination is identified by a BaseLID (Page 4, Section 31: every switch and each port may have one or more Local Identifiers (LIDs)).

Regarding claim 13, Brahmaroutu discloses all the limitations of claim 10. Additionally, Brahmaroutu discloses calculating the plurality of routing trees comprises for each spine in the network (Page 5-6, Section 46-54: the shortest paths between every switch pair are determined by using any All Pair Shortest Paths (APSP) algorithm), calculating a shortest path for the spine node to each of the plurality of end nodes (Page 7, Sections 60: the multi-path algorithm first determines the destination switch that the destination port is directly connected to, then it identifies all the links that exist between the destination switch and other switches in the network).

Regarding claim 14, Brahmaroutu discloses all the limitations of claim 10. Additionally, Brahmaroutu discloses each of the plurality of routing trees comprises at least a portion of a plurality of InfiniBand switches and corresponding plurality of links that form a shortest path from one of the plurality of end nodes to a spine node of the

network (Page 7, Section 60: the multi-path assignment algorithm looks up the best route between the switches from the all-switch shortest paths table).

Regarding claim 15, Brahmaroutu discloses all the limitations of claim 14. Additionally, Brahmaroutu discloses the shortest path is loop-less (Page 6, Section 55: The results from the multi-path assignment algorithm give loop-less path).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims 1-9, 11, and 16-20 are rejected under 35 USC 103(a) as being unpatentable over Brahmaroutu (US 2003/0033427 A1) in view of Steele (US 2003/0118013 A1).

Regarding claim 1, Brahmaroutu discloses a plurality of InfiniBand switches (Figure 1: an InfiniBand switch fabric) coupled to form a network (Figure 2; Page 2, Section 22: a data network with an InfiniBand switch fabric for allowing a host system to communicate to other systems); providing a plurality of sources coupled to the network (Figure 2; Page 2, Section 22: the network allows different host or remote system to

send message); providing a plurality of destinations coupled to the network (Figure 2; Page 2, Section 22: the network allows different host or remote system to receive message); calculating a plurality of routing trees for the plurality of InfiniBand switches (Pages 5-6, Sections 46-54: the shortest paths from each switch to every other switch in the network are computed); calculating a plurality of Destination Local Identifiers (DLIDs) and a set of forwarding instructions for each of the plurality of InfiniBand switches (Page 7, Section 60: a destination local identifier is assigned to a switch port (destination port). The multi-path assignment algorithm first determines the destination switch that the destination port is directly connected to, then it identifies all the links that exist between the destination switch and other switches in the network), each of the plurality of DLIDs corresponds to one of a plurality of routing trees and one of a plurality of destinations (Page 7, Sections 61-63: once all paths are identified, the multi-path algorithm assigns a combination label to a specific path. All direct links that connect the destination switch to other switches are first sorted, then the multi-path algorithm looks up the best route between the switch identified and the switch from the all-switch shortest paths table); populating a forwarding table of each of the plurality of InfiniBand switches in the network with the plurality of DLIDs and the set of forwarding instructions (Page 7, Section 66: once the forwarding tables are built for all switches, the forwarding tables will be downloaded into respective switches in the network). However, Brahmaroutu fails to teach that the switch fabric is a Clos network.

In the same field of endeavor, Steele discloses a Clos switch fabric that provides groups of source and destinations ports as well as routing information (Steele: Figure

1). Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to apply a Clos network as disclosed by Steele into the network of Brahmaroutu. The motivation would have been in reducing latency and minimizing single point failures.

Regarding claim 2, the combination of Brahmaroutu and Steele discloses all the limitations of claim 1 above. Additionally, Brahmaroutu discloses each of the plurality of destinations is identified by a BaseLID (Page 4, Section 31: each port may have one or more Local Identifiers (LIDs)).

Regarding claim 3, the combination of Brahmaroutu and Steele discloses all the limitations of claim 1 above. Additionally, Brahmaroutu discloses calculating the plurality of routing trees comprises for each spine node in the network, calculating a shortest path from the spine node to each of the plurality of sources and each of the plurality of destinations (Pages 5-6, Sections 46-54: the shortest paths between every switch pair are determined by using any All Pair Shortest Paths (APSP) algorithm).

Regarding claim 4, the combination of Brahmaroutu and Steele discloses all the limitations of claim 1 above. Additionally, Brahmaroutu discloses each of the plurality of routing trees comprises at least a portion of the plurality of InfiniBand switches and corresponding plurality of links that form a shortest path from one of the plurality of sources or one of the plurality of destinations to a spine node of the network (Page 7,

Sections 61-63: a destination local identifier is assigned to a switch port (destination port). The multi-path assignment algorithm first determines the destination switch that the destination port is directly connected to, then it identifies all the links that exist between the destination switch and other switches in the network. Once all paths are identified, the multi-path algorithm assigns a combination label to a specific path. All direct links that connect the destination switch to other switches are first sorted, then the multi-path algorithm looks up the best route between the switch identified and the switch from the all-switch shortest paths table).

Regarding claim 5, the combination of Brahmaroutu and Steele discloses all the limitations of claim 1 above. Additionally, Brahmaroutu discloses creating a packet at one of the plurality of sources and is addressed to one of the plurality of destinations (Figure 3; Page 3, Section 27: a header is embedded in the data packet transmitted from a source node to a destination node); executing a rearrangement algorithm for the network (Page 6, Section 55: the multi-path assignment algorithm may also be executed when a topology change, such as an existing link goes down or a new link is inserted, occurs); assigning one of the plurality of DLIDs to the packet (Page 3, Section 28: a packet's header may contain local routing information such as a destination local identifier used to identify the destination port and data path in the data network, and a source local identifier used to identify the source port); and the packet following a path through the InfiniBand switch from one the plurality of sources to the one of a plurality of destinations, where the switch forwards the packet according to the plurality of DLIDs

assigned to the packet (Figure 3; Page 3, Section 28: the header in a packet contains a destination local identifier and source local identifier to identify the destination and source ports for routing by the switches).

Regarding claim 6, the combination of Brahmaroutu and Steele discloses all the limitations of claim 5. Additionally, Brahmaroutu discloses the network operates as a strictly non-interfering network (Page 2, Section 22: separate channels can be used for different functions. For example, a channel may be used for transporting send request and reply messages while another channel may be employed to move data between two nodes through switches so various sources do not attempt to use the same network resources at the same time).

Regarding claim 7, the combination of Brahmaroutu and Steele discloses all the limitations of claim 5. Additionally, Brahmaroutu discloses the packet following the path comprises looking up the one of the plurality of DLIDs assigned to the packet in the forwarding table at each of the portion of the plurality of the InfiniBand switches along the path from the one of the plurality of sources to one of the plurality of destinations (Page 3, Section 28: a packet's header may contain local routing information such as a destination local identifier used to identify the destination port and data path in the data network, and a source local identifier used to identify the source port. They are used for routing by switches within the network).

Regarding claim 8, the combination of Brahmaroutu and Steele discloses all the limitations of claim 5. Additionally, Brahmaroutu discloses the calculation of the plurality of routing trees sufficient to execute the rearrangement algorithm (Pages 5-6, Sections 46-54: the shortest paths between every switch pair are determined by using any All Pair Shortest Paths (APSP) algorithm. Page 6, Section 58: the multi-path algorithm calculates the routing trees for the switch forwarding tables based on the switch connectivity information. Page 6, Section 55: the multi-path algorithm may also be executed when a topology change occurs).

Regarding claim 9, the combination of Brahmaroutu and Steele discloses all the limitations of claim 5. Additionally, Brahmaroutu discloses the packet following the path comprises each of the portion of the plurality of InfiniBand switch forwarding the packet in accordance with the one of the plurality of DLIDs assigned to the packet and the set of forwarding instructions as found in the forwarding table of the InfiniBand switch (Figure 3; Page 3, Section 28: the header in a packet contains a destination local identifier used to identify the destination port and data path and source local identifier to identify the destination and source ports for routing by the switches).

Regarding claim 11, Brahmaroutu discloses all the limitations of claim 10. Additionally, Brahmaroutu discloses a data network with an InfiniBand switch fabric (Figure 1). However, Brahmaroutu fails to teach that the switch fabric is a Clos network.

In the same field of endeavor, Steele discloses a Clos switch fabric that provides

groups of source and destinations ports as well as routing information (Steele: Figure 1). Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to apply a Clos network as disclosed by Steele into the network of Brahmaroutu. The motivation would have been in reducing latency and minimizing single point failures.

Regarding claim 16, Brahmaroutu discloses all the limitations of claim 10. Additionally, Brahmaroutu discloses a network in operation (Figure 2). However, Brahmaroutu fails to teach that the network may be transformed into a Clos network during operation.

In the same field of endeavor, Steele discloses a method for arranging the switch fabric to form a Clos network (Steele: Figure 2). Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to apply the method as disclosed by Steele into the network of Brahmaroutu. The motivation would have been in a more efficient utilization of the switch fabric.

Regarding claim 17, Brahmaroutu discloses a plurality of InfiniBand switches (Figure 1: an InfiniBand switch fabric) coupling a plurality sources and a plurality of destinations to form a network (Figure 2; Page 2, Section 22: a data network with an InfiniBand switch fabric for allowing a host system to communicate to other systems); creating a packet at one of the plurality of sources and is addressed to one of the plurality of destinations (Figure 3; Page 3, Section 27: a header is embedded in the data

packet transmitted from a source node to a destination node); executing a rearrangement algorithm for the network (Page 6, Section 55: the multi-path assignment algorithm may also be executed when a topology change, such as an existing link goes down or a new link is inserted, occurs); assigning one of the plurality of DLIDs to the packet (Page 3, Section 28: a packet's header may contain local routing information such as a destination local identifier used to identify the destination port and data path in the data network, and a source local identifier used to identify the source port); and the packet following a path through the InfiniBand switch from one the plurality of sources to the one of a plurality of destinations, where the switch forwards the packet according to the plurality of DLIDs assigned to the packet (Figure 3; Page 3, Section 28: the header in a packet contains a destination local identifier and source local identifier to identify the destination and source ports for routing by the switches). However, Brahmaroutu fails to teach that the switch fabric is a Clos network.

In the same field of endeavor, Steele discloses a Clos switch fabric that provides groups of source and destinations ports as well as routing information (Steele: Figure 1). Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to apply a Clos network as disclosed by Steele into the teaching of Brahmaroutu. The motivation would have been in reducing latency and minimizing single point failures.

Regarding claim 18, the combination of Brahmaroutu and Steele discloses all limitations of claim 17. Additionally, Brahmaroutu discloses the network operates as a

strictly non-interfering network (Page 2, Section 22, separate channels are used for different functions. For example, a channel may be used for transporting send request and reply messages while another channel may be employed to move data between two nodes through switches so various sources do not attempt to use the same network resources at the same time).

Regarding claim 19, the combination of Brahmaroutu and Steele discloses all the limitations of claim 17. Additionally, Brahmaroutu discloses the packet following the path comprises looking up the one of the plurality of DLIDs assigned to the packet in the forwarding table at the InfiniBand switch (Figure 3; Page 3, Section 28: the header in a packet contains a destination local identifier used to identify the destination port and data path and source local identifier to identify the source ports for routing by the switches).

Regarding claim 20, the combination of Brahmaroutu and Steele discloses all the limitations of claim 17. Additionally, Brahmaroutu discloses the packet following the path comprises the InfiniBand switch forwarding the packet in accordance with the one of the plurality of DLIDs assigned to the packet and the set of forwarding instructions as found in the forwarding table of the InfiniBand switch (Page 2 Section 19: the switch may contain routing information, using explicit routing and/or destination address routing, to route data from a source node to a target node via corresponding links).

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Bertin (US 6,400,681 B1) discloses a method and system for setting up high speed packet switching networks. Yang (US 5,940,389) discloses a self-routing algorithm for Benes networks. Gregory F. Pfister presents an introduction to the InfiniBand architecture.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Juvena W. Loo whose telephone number is (571) 270-1974. The examiner can normally be reached on Mon.-Thurs : 7:30am - 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Frantz Coby can be reached on (571) 272-4017. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a

USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Juvena W Loo
Examiner
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FRANTZ COBY
PRIMARY EXAMINER